EPSY 6350.01
Statistical Methods

INSTRUCTOR: RALPH CARLSON
TERM: SUMMER I 2019
PHONE: (956) 665-3487
EMAIL: ralph.carlson@utrgv.edu
OFFICE LOCATION: EEDU 1.208
OFFICE HOURS: MONDAY-FRIDAY 2:30-4:30 PM

CLASS TIME AND LOCATION: TUESDAY & THURSDAY 4:40-9:40 PM EDU 1.406

Textbook and/or Resource Material
Required Text:

Course Description and Prerequisites
The content of this course will include exploratory and confirmatory data analysis, introduction to conditional probability and Bayesian statistics, central tendency, variance, normal, t chi square, and F distributions, bivariate correlation and regression analysis, t-test between means, goodness of fit and test of independence chi square, independent groups Model 1 one-way ANOVA, and two and three-way factorial ANOVA. There will be an emphasis on hypothesis testing, Type I and II errors, an understanding of statistical significance and practical or functional significance. Prerequisite: NONE

Methods of Instruction (teaching)

A. Direct (expository) teaching
   1. Lecture method of presentation of content (topic or concept):
      gestalt → parts → gestalt →
   2. modeling
   3. demonstrations
   4. guided practice
   5. independent practice

This syllabus subject to change in order to better meet course objectives per discretion of instructor.
6. small group/cooperative learning  
7. measurement and evaluation  

B. Activities  
1. homework (independent practice)  
2. class discussion  
3. review  

C. Methods of Learning for Students  
1. mnemonic system(s)  
2. elaboration of meaning  
3. actively thinking about one’s thinking  
4. management of self and information (content or skills to be acquired)  

D. Methods of Measurement and Evaluation  
1. grading of homework  
2. tests (there will be three tests during the semester)  

†CROSSWALK COURSE  
This course satisfies: Intellectual, professional, and academic development for graduate students, masters and doctoral, and faculty.  

Learning Objectives/Outcomes for the Course  
Student Learning Outcomes  

After instruction/teaching:  

1. Students will be able to utilize and engage rational thought and data.  
2. Students will know what some of the criteria might be for knowing/science.  
3. Students will know what some of the characteristics are for knowledge/science.  
4. Students will know and understand the logic system for hypothesis testing.  
5. Students will be able to partition variance and covariance into its various sources and error term(s).  
6. Students will understand what statistical significance means and what it does not mean.  
7. Students will be able to specify the criteria and conditions for falsifying, debunking, or deleting their most cherished hypotheses, ideas, and theories (Sir Francis Bacon).  
8. Students will be able to interpret effect size/practical/functional/substantive significance: partial eta squared and Cohen’s d.  
9. Students will be able to use exploratory and confirmatory data analysis side by side (Tukey, 1977).
Course Technology
Tools: SPSS (Statistical Package for the Social Sciences)

Technical Knowledge Requirements
You are expected to be proficient with installing and using basic computer applications and have the ability to send and receive email attachments.

Major Requirements, Demonstration of Mastery and Evaluation
Assignments and Assessments

There will be three tests given:

1. Test one covering Chapters 1 through 4 in Hinkle
2. Test two covering Chapters 5, 9, 16, 17, 19, and 20 in Hinkle
3. Test three covering Chapters 7, 8, 10, 13, 14, and 15 in Hinkle

UTRGV University Policies

UTRGV Policy Statements

The UTRGV disability accommodation, mandatory course evaluation statement and sexual harassment statement are required on all syllabi. Additional policy statements are optional, such as those covering attendance, academic integrity, and course drop policies.

STUDENTS WITH DISABILITIES: Required on all syllabi. Do not modify.
If you have a documented disability (physical, psychological, learning, or other disability which affects your academic performance) and would like to receive academic accommodations, please inform your instructor and contact Student Accessibility Services to schedule an appointment to initiate services. It is recommended that you schedule an appointment with Student Accessibility Services before classes start. However, accommodations can be provided at any time.

Brownsville Campus: Student Accessibility Services is located in Cortez Hall Room 129 and

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can be contacted by phone at (956) 882-7374 (Voice) or via email at ability@utrgv.edu. **Edinburg Campus:** Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at ability@utrgv.edu.

**MANDATORY COURSE EVALUATION PERIOD:**

Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (http://my.utrgv.edu); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available:

**TBA**

**ATTENDANCE:**
Students are expected to attend all scheduled classes and may be dropped from the course for excessive absences. UTRGV’s attendance policy excuses students from attending class if they are participating in officially sponsored university activities, such as athletics; for observance of religious holy days; or for military service. Students should contact the instructor in advance of the excused absence and arrange to make up missed work or examinations.

**SCHOLASTIC INTEGRITY:** Recommended on all syllabi.
As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism, and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

**SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE:** Required on all syllabi. Do not modify.
In accordance with UT System regulations, your instructor is a “responsible employee” for reporting purposes under Title IX regulations and so must report any instance, occurring during a student’s time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity including confidential resources available on campus. The faculty and staff of UTRGV actively
strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect in an environment free from sexual misconduct and discrimination.

**COURSE DROPS:** Recommended on all syllabi; may be modified by the instructor as long as it is not inconsistent with UTRGV policy. According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.

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**Course Policies**

*Attendance Policy* (Refer to UTRGV Policy)

**Calendar of Activities**

*Calendar of Activities*

Include in this section a table or list that provides information for students regarding important dates, assignments or activities. The UTRGV academic calendar can be found at http://my.utrgv.edu at the bottom of the screen, prior to login.

(next page)
Academic Calendar Summer I 2019:

**Summer I 2019 Term (June 3 – July 9)**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 4 (Mon.)</td>
<td>Registration Begins</td>
</tr>
<tr>
<td>May 29 (Wed.)</td>
<td>Payment Due</td>
</tr>
<tr>
<td>May 31 (Fri.)</td>
<td>Last day to join a waitlist</td>
</tr>
<tr>
<td>Jun. 3 (Mon.)</td>
<td>Last day to withdraw (drop all classes) and receive a 100% refund</td>
</tr>
<tr>
<td>Jun. 4 (Tues.)</td>
<td>Summer I classes begin</td>
</tr>
<tr>
<td>Jun. 6 (Thurs.)</td>
<td>Last day to withdraw (drop all classes) and receive an 80% refund</td>
</tr>
<tr>
<td>Jun. 27 (Thurs.)</td>
<td>Census Day <em>(last day to drop without it appearing on the transcript)</em></td>
</tr>
<tr>
<td>July 4 (Thurs.)</td>
<td>Last day to drop <em>(DR grade)</em> a class or withdraw <em>(grade of W)</em></td>
</tr>
<tr>
<td>July 8 (Mon.)</td>
<td>Independence Day. No classes.</td>
</tr>
<tr>
<td>July 9 (Tues.)</td>
<td>Study Day. No classes.</td>
</tr>
<tr>
<td>July 10 (Wed.)</td>
<td>Final Exams; Official last day of the Summer I term</td>
</tr>
<tr>
<td></td>
<td>Grades Due at 3 p.m.</td>
</tr>
</tbody>
</table>

Final exam dates for Summer I 2019:

<table>
<thead>
<tr>
<th>If your class is at:</th>
<th>Your exam day and time are:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MTWRF</strong> 8:00 AM – 9:30 AM</td>
<td>Tuesday July 09, 2019 8:00 AM – 9:45 AM</td>
</tr>
<tr>
<td><strong>MTWRF</strong> 9:40 AM – 11:10 AM</td>
<td>Tuesday July 09, 2019 9:55 AM – 11:40 AM</td>
</tr>
<tr>
<td><strong>MTWRF</strong> 11:20 AM – 12:50 PM</td>
<td>Tuesday July 09, 2019 11:50 AM – 1:35 PM</td>
</tr>
<tr>
<td><strong>MTWRF</strong> 1:00 PM – 2:30 PM</td>
<td>Tuesday July 09, 2019 1:45 PM – 3:30 PM</td>
</tr>
<tr>
<td><strong>MTWRF</strong> 2:40 PM – 4:10 PM</td>
<td>Tuesday July 09, 2019 3:40 PM – 5:25 PM</td>
</tr>
<tr>
<td><strong>MTWRF</strong> 4:20 PM – 5:50 PM</td>
<td>Tuesday July 09, 2019 5:35 PM – 7:20 PM</td>
</tr>
</tbody>
</table>

**Evening Classes (Meet Twice a Week)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Day</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW 6:00 PM – 9:45 PM</td>
<td>Monday</td>
<td>July 08, 2019</td>
<td>7:30 PM – 9:15 PM</td>
</tr>
<tr>
<td>TR 6:00 PM – 9:45 PM</td>
<td>Tuesday</td>
<td>July 09, 2019</td>
<td>7:30 PM – 9:15 PM</td>
</tr>
</tbody>
</table>

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GRADING SYSTEM

Criteria

Grade

A  performance greater than plus one standard deviation above the mean
B  performance between plus and minus one standard deviation
C  performance between minus one and minus two standard deviations below the mean
D  performance minus two standard deviations or more below the mean

There will be three tests given:

1. Test one covering Chapters 1 through 4 in Hinkle; and Chapters 1 through 5 in Kachigan.
2. Test two covering Chapters 5, 9, 16, 17, 19, and 20 in Hinkle; and Chapters 9, 10, and 11 in Kachigan.
3. Test three covering Chapters 7, 8, 10, 13, 14, and 15 in Hinkle; and Chapters 9, 12, and 13 in Kachigan.

ATTENDANCE GUIDELINES

A. None Required

B. The student is responsible for any information which is missed during an absence.

TEXTBOOKS


Kachigan, S. Multivariate statistical analysis, Radius Press, 1991. Chapters to be covered in Multivariate statistical analysis: 1, 2, 3, 4, 5, 9, 10, 11, 12, and 13.

READER

INTRODUCTION TO STATISTICAL METHODS
Ralph Carlson, PhD

I. Scientific Method
   A. criteria for science
   B. language of science
   C. quantitative methods
   D. levels of science
   E. two types of research: experimental and correlational

II. Define Measurement
   A. Scales
      1. nominal
      2. ordinal
      3. interval
      4. ratio or absolute
   B. Define Variable
      1. discrete
      2. continuous
      3. independent variable
      4. dependent variables
   C. Summation Notation Symbols
      1. Roman Symbols (sample statistics)
      2. Greek Symbols (population statistics)
      3. - notation
      4. Subscripts

III. Depicting Data
   A. Data
      1. ungrouped data
      2. grouped data (grouping data is antiquated and will not be used in this course)
   B. Tables
      1. summarizing data
      2. APA Publication Manual format
   C. Frequency Distribution or simply called a distribution
      1. cumulative frequency distribution
      2. cumulative percentiles
   D. Graphs (figures)
      1. histogram
      2. frequency polygon
      3. stem - and - leaf
      4. Box - and Whisker plots
IV. Central Tendency
   A. Mode
   B. Median
   C. Mean
      1. two mathematical properties of the mean
      2. central limit theorem
   D. Geometric Mean
   E. Harmonic Mean

V. Variability (scatter, dispersion, heterogeneity)
   A. Range
   B. Variance
   C. Standard Deviation

VI. Univariate Distribution
   A. properties of univariate normal curve
   B. reasons for the importance of the normal curve
   C. shape of distribution
      1. Skewness
      2. Kurtosis

VII. Derived Scores
    A. percentiles
    B. age scores
    C. grade equivalents
    D. standard scores derived through linear transformation & nonlinear transformation

VIII. Bivariate Distribution
    A. covariance
    B. bivariate normal distribution
    C. Pearson product - moment correlation coefficient
    D. formula for Pearson product - moment correlation coefficient (r)
    E. range of values of r
    F. interpretation of correlation coefficient
       1. linear or nonlinear relationship
       2. effects of restricted variance
       3. assumptions
          a. Homoscedasticity
          b. Linearity
   } (bivariate normal)
   G. various bivariate relationships
      1. phi coefficient
      2. point-biserial
      3. tetrachoric
      4. biserial
      5. Spearman Rank - order correlation coefficient
6. Kendall's Tau
7. Goodman-Kruskal Gamma Coefficient

IX. Regression and Prediction
   A. cartesian coordinates
   B. estimating y from x
   C. assumptions: Bivariate normal (homoscedasticity and linearity)
   D. standard error of estimate
   E. nonlinear relationships

X. Multivariate Relationships (a very brief introduction)
   A. partial correlation
   B. multiple correlation
   C. coefficient of concordance

XI. Inferential Statistics
   A. population
   B. sample
   C. random sampling (sampling procedures)
      1. with replacement
      2. without replacement
   D. central limit theorem
   E. standard error of means
   F. interval estimate
   G. point estimate

XII. Hypothesis Testing
    A. research hypothesis (directional and nondirectional)
    B. null hypothesis (directional & nondirectional hypotheses)
    C. type I error (alpha error)
    D. type II error (beta error)
    E. power of a statistical test of significance

XIII. Inferences about a sample(s) mean
    A. t tests:
       1. one sample case
       2. related samples case
       3. independent samples case
    B. assumptions
       1. random sampling
       2. interval scaling
       3. normality-hence, the independence of the mean and variance (error term) (treatment or between and among variance and within or error variance)
       4. homogeneity of variance
C. if assumptions are not supported some possible alternative:
   1. work at more rigorous alpha and report at a less rigorous alpha
   2. use a nonlinear transformation
   3. use an appropriate nonparametric statistic

XIV. Inferences about correlation coefficients
A. correlation hypothesis:
   1. $\rho = 0$
   2. $\rho_1 = \rho_2$
   3. $\rho^2 = K$
   4. $r = 0$ or $\beta = 0$
B. tests of significance:
   1. $t$ - test ( $t$ distribution)
   2. $\chi^2$ chi square ( $\chi^2$ distribution)
   3. multivariate tests of significance; ( a very brief introduction)
      $\chi^2$, $F$ - test, Hotellings $T^2$, and Wilks Lambda
C. assumptions:
   1. bivariate normal for $\rho$
   2. multivariate normal for $\beta$ and $R$
   3. scaling level
   4. random sampling
   5. linearity

XV. Inferences about proportions
A. $z$ test (test of significance):
   1. independent samples
   2. dependent samples
B. $\chi^2$ chi square (test of significance):
   1. linear chi square (goodness of fit)
   2. test of independence chi square
C. assumptions:
   1. nominal scale
   2. observations are independent and mutually exclusive

XVI. Analysis of Variance
A. One-way analysis of variance (ANOVA)
   1. partitioning of total variance into between groups and within groups
      (error variance)
B. tests of significance
   1. $F$ - test (F distribution)
   2. a very brief introduction to multiple comparison procedures (Scheffé)
C. factorial analysis of variance
   1. partitioning of total variance into main effects, interaction effects, and
      error variance
   2. higher order factorial analysis of variance (two-way and three-way)
D. assumptions
   1. random sampling
   2. scaling level (interval)
   3. homogeneity of variance
   4. independent samples
   5. normality

XVII. Two types of research controls
   A. experimental
   B. statistical